

EXHIBIT C

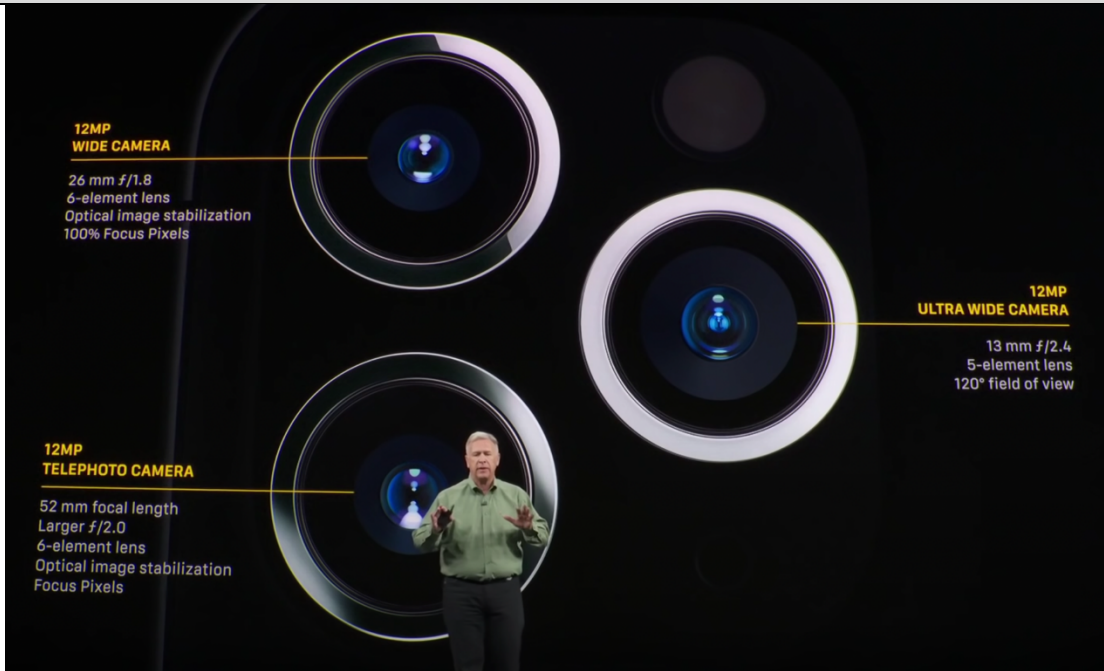
AMENDED EXHIBIT L

Infringement of U.S. 9,185,291 by the iPhone 11, iPhone 11 Pro, iPhone 11 Pro Max, iPhone 12, iPhone 12 mini, iPhone 12 Pro, iPhone 12 Pro Max, iPhone 13, iPhone 13 mini, iPhone 13 Pro, iPhone 13 Pro Max, iPad Pro 11-inch (2nd generation), iPad Pro 11-inch (3rd generation), iPad Pro 12.9-inch (4th generation), and iPad Pro 12.9-inch (5th generation)

Apple Inc. (“Apple”) infringes Claims 1, 2, 3, 4, 5, 10, 12, and 13 of U.S. Pat. No. 9,185,291 (the “’291 patent”) by making, using, selling, and/or offering for sale the iPhone 11, iPhone 11 Pro, iPhone 11 Pro Max, iPhone 12 mini, iPhone 12, iPhone 12 Pro, iPhone 12 Pro Max, iPhone 13, iPhone 13 mini, iPhone 13 Pro, iPhone 13 Pro Max, [iPhone 14, iPhone 14 Plus, iPhone 14 Pro, iPhone 14 Pro Max](#), and infringes Claims 1, 2, 3, 4, 10, 12, and 13 of the ’291 patent by making, using, selling, and/or offering for sale the iPad Pro 11-inch (2nd generation), iPad Pro 11-inch (3rd generation), iPad Pro 12.9-inch (4th generation), and iPad Pro 12.9-inch (5th generation) mobile devices (the “Accused Product”).¹

Claim	Claim Element	Accused Product
1.[a]	A zoom digital camera comprising:	To the extent that the preamble is limiting, the Accused Products include zoom digital camera. Each of the Accused Products includes a zoom digital camera, e.g., for the iPhone 11 Pro:

¹ These Infringement Contentions are preliminary, and they are based on information reasonably available to Corephotonics at this time. By presenting this early disclosure of its infringement contentions pursuant to the Patent Local Rules, Corephotonics does not waive any evidentiary objections or applicable privileges, including work product, with respect to the information disclosed. Corephotonics is not presenting these infringement contentions as a proffer of the facts of infringement, rather only as an exemplary illustration of the theories underlying its infringement contentions in this case. Discovery has only recently opened in this case, Apple has not produced any documents describing the accused functionalities, and Corephotonics’ investigation is ongoing. Corephotonics reserves the right to modify its infringement contentions as the case progresses. Corephotonics further reserves the right to supplement, modify, or seek to amend its infringement contentions consistent with applicable Local Rules and Court Orders.


Claim	Claim Element	Accused Product		
		<div></div> <p>(“September Event 2019 – Apple,” https://www.youtube.com/watch?v=rAeqN-Q7x4)</p> <p>Each of the Accused Products includes “2x optical zoom out”:</p> <table><tr><td>Camera</td><td>Dual 12MP Wide and Ultra Wide cameras Wide: $f/1.8$ aperture Ultra Wide: $f/2.4$ aperture and 120° field of view 2x optical zoom out Digital zoom up to 5x</td></tr></table> <p>(https://www.apple.com/iphone-11/specs/; <i>see also</i> https://support.apple.com/kb/SP805?locale=en_US, https://www.apple.com/iphone-12/specs/, https://support.apple.com/kb/SP831?locale=en_US,</p>	Camera	Dual 12MP Wide and Ultra Wide cameras Wide: $f/1.8$ aperture Ultra Wide: $f/2.4$ aperture and 120° field of view 2x optical zoom out Digital zoom up to 5x
Camera	Dual 12MP Wide and Ultra Wide cameras Wide: $f/1.8$ aperture Ultra Wide: $f/2.4$ aperture and 120° field of view 2x optical zoom out Digital zoom up to 5x			


Claim	Claim Element	Accused Product
		https://www.apple.com/iphone-13/specs/ , https://www.apple.com/iphone-13-pro/specs/ , https://www.apple.com/iphone-14/specs/ , https://www.apple.com/iphone-14-pro/specs/ , https://www.apple.com/ipad-pro/specs/ , https://support.apple.com/kb/SP814?locale=en_US , https://support.apple.com/kb/SP815?locale=en_US)
1.[b]	a) a Wide imaging section that includes a fixed focal length Wide lens with a Wide field of view (FOV), a Wide sensor and a Wide image signal processor (ISP), the Wide imaging section operative to provide Wide image data of an object or scene;	<p>The Accused Products include a zoom digital camera which includes a wide-angle imaging section (identified by Apple as the “ultra wide” camera). For the iPhone Accused Products, Apple identifies the field of view as 120° and the sensor as 12 megapixel, while for the iPad Accused Products, Apple identifies the field of view as 125° and the sensor as 10 megapixel.</p> <p>(https://www.apple.com/iphone-11/specs/; <i>see also</i> https://support.apple.com/kb/SP805?locale=en_US, https://www.apple.com/iphone-12/specs/, https://support.apple.com/kb/SP831?locale=en_US, https://www.apple.com/iphone-13/specs/, https://www.apple.com/iphone-13-pro/specs/, https://www.apple.com/iphone-14/specs/, https://www.apple.com/iphone-14-pro/specs/, https://www.apple.com/ipad-pro/specs/, https://support.apple.com/kb/SP814?locale=en_US, https://support.apple.com/kb/SP815?locale=en_US.)</p> <p>The Accused Products include a processor that processes image data from the claimed tele camera, <i>e.g.</i>, the Apple A series or M series SoC processor.</p> <p>To the extent that Apple contends that the cameras that it describes in marketing materials as the “ultra wide” and the “wide” cameras do not satisfy the claimed “Wide imaging section that includes a fixed focal length Wide lens with a Wide field of view (FOV)” and “Tele imaging section that includes a fixed focal length Tele lens with a Tele FOV that is narrower than the Wide FOV” limitations, these limitations are satisfied under the doctrine of equivalents. The “wide” camera has a narrower field of view than the “ultra wide” camera, and the products that include these two cameras are built and operate in a way that is insubstantially different from the claimed invention, even though Apple’s</p>

Claim	Claim Element	Accused Product
		marketing materials may describe the cameras using different terms than the asserted claims. Moreover, the presence of an additional camera that Apple describes as “telephoto” in some of the accused products does not alter the fact that the “ultra wide” and “wide” cameras are insubstantially different from the claimed invention.
1.[c]	a Tele imaging section that includes a fixed focal length Tele lens with a Tele FOV that is narrower than the Wide FOV, a Tele sensor and a Tele ISP, the Tele imaging section operative to provide Tele image data of the object or scene; and	<p>The Accused Product includes a zoom digital camera which includes a tele imaging section (identified by Apple as the “wide” camera).</p> <p>In the iPhone Accused Products this imaging section has an equivalent focal length of <u>24 or 26 mm</u> (field of view approximately 80-<u>84°</u>), while in the iPad Accused Products it has an equivalent focal length of 29 mm (field of view approximately 73.5°). https://www.youtube.com/watch?v=-rAeqN-Q7x4 at 51:00, 1:17:35; https://www.youtube.com/watch?v=KR0g-1hnQPA at 32:50, 49:55, 51:20; https://www.youtube.com/watch?v=EvGOIAkLSLw at 45:55; https://www.dpreview.com/articles/6780391159/all-apple-iphone-13-and-13-pro-camera-upgrades-explained; https://www.camera-m.com/blog/deeper-look-at-2020-ipad-pro-cameras; https://www.youtube.com/watch?v=ux6zXguiqxM at 52:15, 1:18:45; https://www.apple.com/iphone-14/specs/, https://www.apple.com/iphone-14-pro/specs/ https://www.camera-m.com/blog/deeper-look-at-2020-ipad-pro-cameras; https://www.dpreview.com/articles/6110937480)</p> <p>The Accused Products include a processor that processes image data from the claimed tele camera, <i>e.g.</i>, the Apple A series or M series SoC processor.</p> <p>To the extent that Apple contends that the cameras that it describes in marketing materials as the “ultra wide” and the “wide” cameras do not satisfy the claimed “Wide imaging section that includes a fixed focal length Wide lens with a Wide field of view (FOV)” and “Tele imaging section that includes a fixed focal length Tele lens with a Tele FOV that is narrower than the Wide FOV” limitations, these limitations are satisfied under the doctrine of equivalents. The “wide” camera has a narrower field of view than the “ultra wide” camera, and the products that include these two cameras are built and operate in a way that is insubstantially different from the claimed invention, even though Apple’s</p>

Claim	Claim Element	Accused Product
		marketing materials may describe the cameras using different terms than the asserted claims. Moreover, the presence of an additional camera that Apple describes as “telephoto” in some of the accused products does not alter the fact that the “ultra wide” and “wide” cameras are insubstantially different from the claimed invention.
1.[d]	c) a camera controller operatively coupled to the Wide and Tele imaging sections, the camera controller configured to combine in still mode at least some of the Wide and Tele image data to provide a fused output image of the object or scene from a particular point of view and	<p>The Accused Product includes a camera controller, <i>e.g.</i>, processes or systems running on the Apple A-series or M-series system-on-a-chip (SoC) processor discussed above, which is configured to combine in still mode at least some of the Wide and Tele image data to provide a fused output image of the object or scene from a particular point of view.</p> <p><i>See, e.g.</i>, “What's new in Camera Capture on iPhone 7 and iPhone 7 Plus,” https://forums.developer.apple.com/thread/63347 (Authored by “Apple Staff”).</p> <p><i>iPhone 7 Plus Dual Cameras</i></p> <p>iPhone 7 Plus features two 12 megapixel cameras on the back: one wide-angle (28mm, f/1.8) and one telephoto (56 mm, f/2.8). These two cameras can be discovered and used independently, or as a single virtual camera that automatically switches between physical cameras for zoom — in effect turning two prime lens cameras into a single zoom lens camera. With a proliferation of cameras on iPhone 7 Plus and the need to differentiate between them, AVCaptureDevice now exposes a readonly – deviceType property, which can be one of the following enumerated values:</p> <p>...</p> <p>The Dual camera's defining feature is its ability to smoothly transition between wide and tele cameras, acting like a single lens camera with</p>

Claim	Claim Element	Accused Product
		<p>optical zoom at 2x. Zoom operations are performed on the Dual camera using the familiar –[AVCaptureDevice setVideoZoomFactor:] or – [AVCaptureDevice rampToVideoZoomFactor:withRate:] APIs. Video zoom factor is always expressed in terms of the wide-angle camera, even when only the telephoto camera is in use. When zoomed, the Dual camera intelligently fuses images from the wide-angle and telephoto cameras to improve image quality. This process is transparent to the user and happens automatically when you take pictures using AVCapturePhotoOutput or AVCaptureStillImageOutput. The point at which the cross over from wide-angle to telephoto happens depends on a variety of factors including current focus position, current zoom factor, and current exposure. Because the Dual camera can change at unpredictable times between formats with different ISO ranges and focal lengths, certain AVCaptureDevice manual control APIs are not supported, as the preservation of locked or custom control values would result in visually jarring jumps in focus position, exposure, or white balance when changing between cameras. When using the Dual camera AVCaptureDevice, the following manual control API restrictions apply:</p> <p>While the Apple Staff posted cited above relates specifically to the iPhone 7 Plus, API functions such as setVideoZoomFactor and rampToVideoZoomFactor:withRate apply equally to each of the Accused Products. The Accused Products likewise “combine in still mode at least some of the Wide and Tele image data to provide a fused output image of the object or scene from a particular point of view,” as can be illustrated by an experiment. The following still photograph was captured using an Accused Product with the zoom set so that the field of view of the output image is greater than that of the claimed tele (“wide” in Apple’s terminology) imaging section, such that at least some</p>

Claim	Claim Element	Accused Product
		<p>image data from the claimed wide (“ultra wide” in Apple’s terminology) imaging section is required to produce the output image:</p>  <p>The following still photograph was captured using the same Accused Product, with the only change being that the aperture of the claimed tele (“wide” in Apple’s terminology) imaging section was covered to block light from entering it:</p>

Claim	Claim Element	Accused Product
		 <p>As can be seen, the picture has changed when the claimed tele imaging section was covered. Accordingly, the camera controller must be combining at least some of the wide image data (to provide the full field of view) with at least some of the tele image data. Further, the picture in each case is from the point of view of the claimed wide camera, as the point of view does not change when the claimed tele camera is covered and the only image data that contains the scene is from the claimed wide camera.</p>

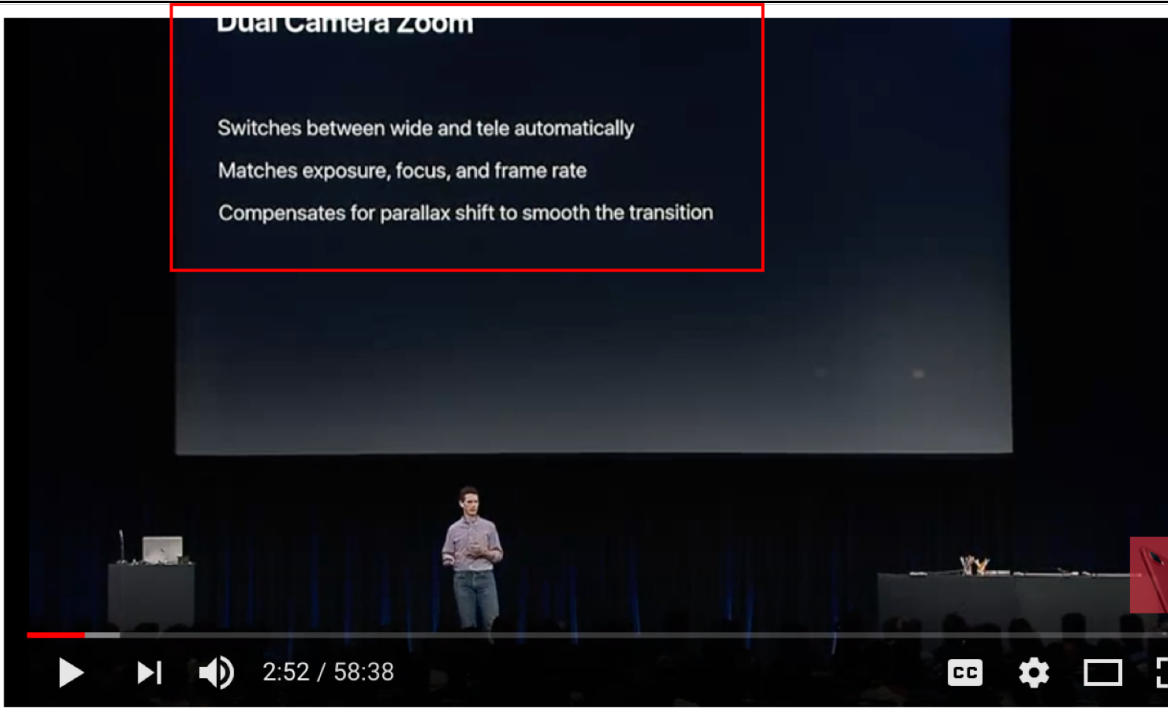
Claim	Claim Element	Accused Product
		To the extent that Apple contends that the Accused Products do not literally infringe this limitation, because there are some circumstances where the product exhibits different or additional behavior to the behavior recited in the limitation, these products still infringe under at least the doctrine of equivalents, as they perform substantially the claimed behavior under typical and intended usage scenarios.
1.[e]	to provide without fusion continuous zoom video mode output images of the object or scene, each output image having a respective output resolution;	<p>The Accused Product includes a camera controller, <i>e.g.</i>, processes running on the Apple A-series or M-series processor identified above, which is configured or programmed to provide without fusion continuous zoom video mode output images of the object or scene.</p> <p>For example, the video output at various zoom factors does not demonstrate fusion. Rather, for zoom factors that result in a field of view of the output image that is greater than that of the claimed tele (“wide” in Apple’s terminology) imaging section, the observable input is only from the wide-angle camera (<i>e.g.</i>, covering the tele camera does not change image quality).</p> <p><i>See, e.g.</i>, “What’s new in Camera Capture on iPhone 7 and iPhone 7 Plus,” https://forums.developer.apple.com/thread/63347 (Authored by “Apple Staff”).</p> <p><i>iPhone 7 Plus Dual Cameras</i></p> <p>iPhone 7 Plus features two 12 megapixel cameras on the back: one wide-angle (28mm, f/1.8) and one telephoto (56 mm, f/2.8). These two cameras can be discovered and used independently, or as a single virtual camera that automatically switches between physical cameras for zoom — in effect turning two prime lens cameras into a single zoom lens camera.</p> <p>...</p> <p>The Dual camera's defining feature is its ability to smoothly transition between wide and tele cameras, acting like a single lens camera with</p>

Claim	Claim Element	Accused Product
		<p>optical zoom at 2x. Zoom operations are performed on the Dual camera using the familiar –[AVCaptureDevice setVideoZoomFactor:] or – [AVCaptureDevice rampToVideoZoomFactor:withRate:] APIs. Because the Dual camera can change at unpredictable times between formats with different ISO ranges and focal lengths, certain AVCaptureDevice manual control APIs are not supported, as the preservation of locked or custom control values would result in visually jarring jumps in focus position, exposure, or white balance when changing between cameras. When using the Dual camera AVCaptureDevice, the following manual control API restrictions apply:</p> <p>While the Apple Staff posted cited above relates specifically to the iPhone 7 Plus, API functions such as setVideoZoomFactor and rampToVideoZoomFactor:withRate apply equally to each of the Accused Products.</p> <p>To the extent that Apple contends that the Accused Products do not literally infringe this limitation, because there are some circumstances where the product exhibits different or additional behavior to the behavior recited in the limitation, these products still infringe under at least the doctrine of equivalents, as they perform substantially the claimed behavior under typical and intended usage scenarios.</p>
1.[f]	wherein the video output images are provided with a smooth transition when switching between a lower zoom factor (ZF) value and a higher ZF value or vice versa,	<p>The Accused Product includes a camera controller, <i>e.g.</i>, processes running on the Apple A-series or M-series processor identified above, which is configured to provide video output images during continuous zoom with a smooth transition when switching between a lower zoom factor (ZF) value and a higher ZF value or vice versa,.</p> <p><i>See, e.g.</i>, “What's new in Camera Capture on iPhone 7 and iPhone 7 Plus,” https://forums.developer.apple.com/thread/63347 (Authored by “Apple Staff”).</p>

Claim	Claim Element	Accused Product
		<p><i>iPhone 7 Plus Dual Cameras</i></p> <p>iPhone 7 Plus features two 12 megapixel cameras on the back: one wide-angle (28mm, f/1.8) and one telephoto (56 mm, f/2.8). These two cameras can be discovered and used independently, or as a single virtual camera that automatically switches between physical cameras for zoom — in effect turning two prime lens cameras into a single zoom lens camera. With a proliferation of cameras on iPhone 7 Plus and the need to differentiate between them, AVCaptureDevice now exposes a readonly – deviceType property, which can be one of the following enumerated values:</p> <p> AVCaptureDeviceTypeBuiltInMicrophone – an audio capture device (microphone)</p> <p> AVCaptureDeviceTypeBuiltInWideAngleCamera – A wide angle camera. All iOS 10 supported devices present front and back cameras as built-in wide angle cameras (except for the new telephoto camera on iPhone 7 Plus).</p> <p> AVCaptureDeviceTypeBuiltInTelephotoCamera – The new 56 mm telephoto rear-facing camera on iPhone 7 Plus.</p> <p> AVCaptureDeviceTypeBuiltInDuoCamera – A virtual camera on iPhone 7 Plus that switches between wide-angle and telephoto seamlessly for a smooth zoom.</p> <p>...</p>

Claim	Claim Element	Accused Product
		<p>The Dual camera's defining feature is its ability to smoothly transition between wide and tele cameras, acting like a single lens camera with optical zoom at 2x. Zoom operations are performed on the Dual camera using the familiar <code>-[AVCaptureDevice setVideoZoomFactor:]</code> or <code>-[AVCaptureDevice rampToVideoZoomFactor:withRate:]</code> APIs. . . . Because the Dual camera can change at unpredictable times between formats with different ISO ranges and focal lengths, certain AVCaptureDevice manual control APIs are not supported, as the preservation of locked or custom control values would result in visually jarring jumps in focus position, exposure, or white balance when changing between cameras.</p> <p>Apple provides API(s) to control programming that allows a smooth transition to occur. See, e.g., “rampToVideoZoomFactor:withRate:,” https://developer.apple.com/documentation/avfoundation/avcapturedevice/1624614-ramptovideozoomfactor.</p> <p>Instance Method</p> <p>rampToVideoZoomFactor:withRate:</p> <p>Begins a smooth transition from the current zoom factor to another.</p>


Claim	Claim Element	Accused Product
		<p><i>See also, e.g., “videoZoomFactor,”</i> https://developer.apple.com/documentation/avfoundation/avcapturedevice/1624611-videozoomfactor.</p> <p>Instance Property</p> <p>videoZoomFactor</p> <p>A value that controls the cropping and enlargement of images captured by the device.</p> <p><i>See, e.g., “WWDC 2017 Video Session – Capturing Depth in iPhone Photography,”</i> Brad Ford (Apple), https://developer.apple.com/videos/play/wwdc2017/507/ at 2:25 (describing a “smooth transition”).</p>


Claim	Claim Element	Accused Product
		 <p>Dual Camera Zoom</p> <ul style="list-style-type: none"> Switches between wide and tele automatically Matches exposure, focus, and frame rate Compensates for parallax shift to smooth the transition <p><i>See also, e.g., “iPhone 7 Plus Dual Camera Test (Zoom and Quality),”</i> https://www.youtube.com/watch?v=G_GqCcJs2JI (showing the transition during zoom from the wide-angle camera to tele camera).</p>

Claim	Claim Element	Accused Product
		<p><i>See, e.g.,</i> “AVCaptureDeviceTypeBuiltInDualCamera,” https://developer.apple.com/documentation/avfoundation/avcapturedevicetypebuiltinDualCamera</p> <p>Global Variable</p> <h2>AVCaptureDeviceTypeBuiltInDualCamera</h2> <p>A combination of wide-angle and telephoto cameras that creates a capture device capable of photo, video, and depth capture, with enhanced zoom and dual-image capture features.</p> <p>amera.</p> <p><i>See also, e.g.,</i> “AVCaptureDeviceTypeBuiltInDuoCamera,” https://developer.apple.com/documentation/avfoundation/avcapturedevicetypebuiltinDuoCamera amera.</p> <p>While the AVCaptureDeviceTypeBuiltInDuoCamera device type has been deprecated, it was been replaced with the “equivalent” AVCaptureDeviceTypeBuiltInDualCamera device type. https://developer.apple.com/documentation/avfoundation/avcapturedevicetypebuiltinDualCamera) As it pertains to video capture, Apple’s developer documentation describes substantially the same functionality for the AVCaptureDeviceTypeBuiltInDualWideCamera and AVCaptureDeviceTypeBuiltInTripleCamera device types that apply to the Accused Products as for the AVCaptureDeviceTypeBuiltInDualCamera device type. (<i>See</i> https://developer.apple.com/documentation/avfoundation/avcapturedevicetypebuiltinDualCamera, https://developer.apple.com/documentation/avfoundation/avcapturedevicetypebuiltinDualCamera</p>

Claim	Claim Element	Accused Product
		<p>widecamera, https://developer.apple.com/documentation/avfoundation/avcapturedevicetypebuiltintriplecamera.)</p> <p>While certain of the above cited documents relate specifically to the iPhone 7 Plus, a similar smooth transition between the claimed wide and tele sensors for video output is provided for each of the Accused Products. For example, third-party testing indicates:</p> <p>Smooth and precise zooming</p> <hr/> <p>Another unique feature of Apple's new Immersive UI is its uniquely precise zoom control for both photography and videography, coupled with remarkably smooth zooming throughout the iPhone 11 Pro's zoom range. Multi-camera phones typically show artifacts when switching between their differing focal length cameras during zooming, but as part of its "cinema quality" video experience, the iPhone 11 has made those transitions almost invisible.</p> <p>"Apple iPhone 11 Pro: Exploring the new camera features," https://www.dxomark.com/apple-iphone-11-pro-exploring-the-new-camera-features/; see "Apple iPhone 11, video zoom," https://www.youtube.com/watch?v=Q0wd7CbsP8w.</p> <p>"A Guided Tour of iPhone 14 & iPhone 14 Pro Apple," https://www.youtube.com/watch?v=cgpSBjWutGY at 2:15.</p> <p>"Introducing iPhone 14 Pro Apple," https://www.youtube.com/watch?v=FT3ODSg1GFE at 1:14.</p> <p>To the extent that Apple contends that the Accused Products do not literally infringe this limitation, because there are some circumstances where the product exhibits different or additional behavior to the behavior recited in the limitation, these products still infringe under at least the doctrine of equivalents, as they perform substantially the claimed behavior under typical and intended usage scenarios.</p>

Claim	Claim Element	Accused Product
1.[g]	wherein at the lower ZF value the output resolution is determined by the Wide sensor, and wherein at the higher ZF value the output resolution is determined by the Tele sensor.	<p>As disclosed above, <i>e.g.</i>, for elements 1.[d]-[e], The camera controller for the rear multi-aperture camera of the Accused Product (<i>e.g.</i>, as identified above for element 1.[d] has been configured or programmed such that at higher zoom information is obtained from the tele camera sensor, and at lower zoom factors where the tele camera with its narrower field of view cannot provide the complete field of view, information is obtained from the wide camera sensor. For example, the transition between wide and tele cameras in video mode includes matching the position of the output image before and after the transition (upward zoom or downward zoom) allowing for continuous operation.</p> <p>Furthermore, Apple’s API documentation confirms that the Accused Products perform “automatic switching” between claimed wide and tele sensors as a function of “zoom factor”:</p> <p>Discussion</p> <p>The built-in dual camera supports the following features:</p> <ul style="list-style-type: none"> • Automatic switching from one camera to another when zoom factor, light level, and focus position allow. <p>See “AVCaptureDeviceTypeBuiltInDualWideCamera,” https://developer.apple.com/documentation/avfoundation/avcapturedevicetypebuiltinwidecamera, “AVCaptureDeviceTypeBuiltInTripleCamera,” https://developer.apple.com/documentation/avfoundation/avcapturedevicetypebuiltintriplecamera.</p> <p>To the extent that Apple contends that the Accused Products do not literally infringe this limitation, because there are some circumstances where the product exhibits different or additional behavior to the behavior recited in the limitation, these products still infringe under at least the doctrine of equivalents, as they perform substantially the claimed behavior under typical and intended usage scenarios.</p>

Claim	Claim Element	Accused Product
2.	The camera of claim 1, wherein the controller includes a user control module for receiving user inputs and a sensor control module for configuring each sensor to acquire the Wide and Tele image data based on the user inputs.	<p>The camera controller for the rear multi-aperture camera of the Accused Product (<i>e.g.</i>, as identified above for element 1.[d]) has been configured or programmed such that there is a user control module for receiving user inputs and a sensor control module for configuring each sensor to acquire the Wide and Tele image data based on the user inputs.</p> <p>The user inputs are obtained through graphically user interface (GUI) controls. By way of example, one such user control is the slider wheel with zoom level indicator on the GUI of the Accused Product. <i>See, e.g.</i>,</p> 

Claim	Claim Element	Accused Product
		<p data-bbox="688 235 1749 305">When the indicated “1X” button is touched and held, the zoom can be increased or decreased by swiping right or left.</p>  <p data-bbox="688 1052 1661 1122">See, e.g., “How to use the ultra wide camera on iPhone 11 and 12,” https://9to5mac.com/2021/09/05/use-ultra-wide-camera-iphone-11-and-12/.</p> <p data-bbox="688 1162 1457 1232">“A Guided Tour of iPhone 14 & iPhone 14 Pro Apple,” https://www.youtube.com/watch?v=cgpSBjWutGY at 2:15.</p> <p data-bbox="688 1273 1472 1343">“Introducing iPhone 14 Pro Apple,” https://www.youtube.com/watch?v=FT3ODSg1GFE at 1:14.</p>

Claim	Claim Element	Accused Product
		<p>The user interface control may also adjust the zoom level by using a “pinch to zoom” feature in which a user touches the screen and applies a “pinching” gesture to zoom the image in or out.</p> <p>At lower zoom factors, the tele camera, which has a relatively narrow field of view, cannot capture the whole image, so to provide full resolution across the range of the image, the camera controller system on the processor is configured or programmed such that image data is obtained from the sensor of the wide camera. At higher zoom factors, where the tele camera the camera controller system on the processor is configured or programmed such that image data is obtained from the sensor of the tele camera</p>
3.	The camera of claim 2, wherein the user inputs include a zoom factor, a camera mode and a region of interest (ROI).	<p>The camera controller for the rear multi-aperture camera of the Accused Product (<i>e.g.</i>, as identified above for element 1.[d]) has been configured or programmed such that the user inputs to the user control module (<i>i.e.</i>, as identified above in the mapping for Claim 2) include a zoom factor, a camera mode and a region of interest (ROI).</p> <p>For example, as shown above in the mapping for Claim 2, the user can input through GUI controls the zoom factor, select a region of interest (ROI), <i>i.e.</i>, an area to focus on, and select either still or video camera modes (<i>i.e.</i>, by selecting “video” or “photo” modes through the GUI).</p>
4.	The camera of claim 2, wherein the sensor control module has a setting that depends on the Wide and Tele fields of view and on a sensor oversampling ratio, the setting used in the configuration of each sensor.	<p>The camera controller for the rear multi-aperture camera of the Accused Product (<i>e.g.</i>, as identified above for element 1.[d]) is configured such that the sensor control module has a setting that depends on the fields of view of the wide and tele cameras and on an oversampling ratio, <i>i.e.</i>, the number of sensor in-line pixels divided by the number of output frame image in-line pixels.</p> <p>Depending on the size of the output field that is selected, the zoom ratio may be higher than the relative fields of view, which is in the Accused Products is 2.0 (<i>see</i> elements 1.[b] and 1.[c] above), <i>i.e.</i>, the transition between cameras would occur at a zoom ratio higher than that optical zoom ratio, 2.0.</p>

Claim	Claim Element	Accused Product
		<p><i>See, e.g.</i>, “What's new in Camera Capture on iPhone 7 and iPhone 7 Plus,” https://forums.developer.apple.com/thread/63347 (Authored by “Apple Staff”) (“The point at which the cross over from wide-angle to telephoto happens depends on a variety of factors including current focus position, current zoom factor, and current exposure. Because the Dual camera can change at unpredictable times between formats with different ISO ranges and focal lengths, certain AVCaptureDevice manual control APIs are not supported, as the preservation of locked or custom control values would result in visually jarring jumps in focus position, exposure, or white balance when changing between cameras.”)</p> <p>Apple’s APIs provide an interface to execute the configuration of the sensor control module that allows for this transition point to be variable as described in the aforementioned. <i>See also, e.g., id.</i> (“Zoom operations are performed on the Dual camera using the familiar -[AVCaptureDevice setVideoZoomFactor:] or -[AVCaptureDevice rampToVideoZoomFactor:withRate:] APIs.”)</p> <p>Discussion</p> <p>The built-in dual camera supports the following features:</p> <ul style="list-style-type: none"> • Automatic switching from one camera to another when zoom factor, light level, and focus position allow. <p><i>See</i> “AVCaptureDeviceTypeBuiltInDualWideCamera,” https://developer.apple.com/documentation/avfoundation/avcapturedevicetypebuiltinwidecamera, “AVCaptureDeviceTypeBuiltInTripleCamera,” https://developer.apple.com/documentation/avfoundation/avcapturedevicetypebuiltintriplecamera.</p>

Claim	Claim Element	Accused Product
5.	<p>The camera of claim 4, wherein the Wide and Tele FOVs and the sensor oversampling ratio satisfy the condition</p> $0.8 * PL_{Wide} / PL_{video} < \tan(FOV_{Wide}) / \tan(FOV_{Tele}) < 1.2 * PL_{Wide} / PL_{video},$ <p>wherein PL_{Wide} is an in-line number of Wide sensor pixels and wherein PL_{video} is an in-line number of output video format pixels.</p>	<p>The camera controller for the rear multi-aperture camera of the Accused Product (<i>e.g.</i>, as identified above for element 1.[d]) is configured such that the oversampling ratio identified above for Claim 4 and the fields of view of the wide and tele cameras identified for Claim elements 1.[b] and 1.[c] above satisfy the condition $0.8 * PL_{Wide} / PL_{video} < \tan(FOV_{Wide}) / \tan(FOV_{Tele}) < 1.2 * PL_{Wide} / PL_{video}$, wherein PL_{Wide} is an in-line number of Wide sensor pixels and wherein PL_{video} is an in-line number of output video format pixels.</p> <p>For example, the iPhone Accused Products support 1080p video mode and have a 12 megapixel sensor for the “ultra wide” camera. (https://www.apple.com/iphone-11/specs/; see also https://support.apple.com/kb/SP805?locale=en_US, https://www.apple.com/iphone-12/specs/, https://support.apple.com/kb/SP831?locale=en_US, https://www.apple.com/iphone-13/specs/, https://www.apple.com/iphone-13-pro/specs/, https://www.apple.com/iphone-14/specs/, https://www.apple.com/iphone-14-pro/specs/.)</p> <p>In that mode, PL_{Wide} is approximately 4032 pixels, and PL_{video} is approximately 1920 pixels. Based on the fields of view of the wide and tele cameras, the Accused Product has $\tan(FOV_{Wide}) = \tan(60^\circ) = 1.73$ and $\tan(FOV_{Tele}) = \tan(40^\circ) = 0.84$. Accordingly, in 1080p video mode, the said ratio is satisfied.</p>
10.	<p>The camera of claim 1, wherein the camera controller configuration to provide video output images with a smooth transition when switching between a lower ZF value and a higher ZF value or vice versa includes a configuration that uses information either from</p>	<p>The camera controller for the rear multi-aperture camera of the Accused Product (<i>e.g.</i>, as identified above for element 1.[d]) has been configured or programmed such that it uses information (<i>i.e.</i> image data) either from the Wide sensor or from the Tele sensor. For example, at higher zoom information is obtained from the tele camera sensor, and at lower zoom factors where the tele camera with its narrower field of view cannot provide the complete field of view, information is obtained from the wide-angle camera sensor.</p>

Claim	Claim Element	Accused Product
	the Wide sensor or from the Tele sensor.	
12.[a]	A method for obtaining zoom images of an object or scene in both still and video modes using a digital camera, the method comprising the steps of:	<p>To the extent that the preamble is limiting, Apple and/or its customers or end-users of the Accused Product practice a method to obtain zoom images of an object in both still and video modes using a digital camera of the Accused Product, in particular, the rear multi-aperture camera of the Accused Product that includes both a wide and a tele camera lens assembly.</p> <p><i>See, e.g., element 1[a] mapped above.</i></p>
12.[b]	a) providing in the digital camera a Wide imaging section having a Wide lens with a Wide field of view (FOV), a Wide sensor and a Wide image signal processor (ISP),	<p>Apple and/or its customers or end-users of the Accused Product practice a method to provide in the hardware of the Accused Product a Wide lens with a Wide field of view (FOV), a Wide sensor and a Wide image signal processor (ISP).</p> <p><i>See, e.g., element 1.[b] mapped above.</i></p>
12.[c]	a Tele imaging section having a Tele lens with a Tele FOV that is narrower than the Wide FOV, a Tele sensor and a Tele ISP, and	<p>Apple and/or its customers or end-users of the Accused Product practice a method to provide in the hardware of the Accused Product a Tele imaging section having a Tele lens with a Tele FOV that is narrower than the Wide FOV, a Tele sensor and a Tele ISP, and a camera controller operatively coupled to the Wide and Tele imaging sections.</p> <p><i>See, e.g., element 1.[c] mapped above.</i></p>
12.[d]	a camera controller operatively coupled to the Wide and Tele imaging sections; and	<p>Apple and/or its customers or end-users of the Accused Product practice a method to provide in the hardware of the Accused Product a camera controller operatively coupled to the Wide and Tele imaging sections.</p> <p><i>See, e.g., element 1.[d] mapped above.</i></p>
12.[e]	b) configuring the camera controller to	<p>Apple and/or its customers or end-users of the Accused Product practice a method to configure the said camera controller in the hardware of the Accused Product to combine</p>

Claim	Claim Element	Accused Product
	combine in still mode at least some of the Wide and Tele image data to provide a fused output image of the object or scene from a particular point of view, and	<p>in still mode at least some of the Wide and Tele image data to provide a fused output image of the object or scene from a particular point of view.</p> <p><i>See, e.g.,</i> element 1.[d] mapped above.</p> <p>To the extent that Apple contends that the Accused Products do not literally infringe this limitation, because there are some circumstances where the product exhibits different or additional behavior to the behavior recited in the limitation, these products still infringe under at least the doctrine of equivalents, as they perform substantially the claimed behavior under typical and intended usage scenarios.</p>
12.[f]	to provide without fusion continuous zoom video mode output images of the object or scene,	<p>Apple and/or its customers or end-users of the Accused Product practice a method to configure the said camera controller in the hardware of the Accused Product to provide without fusion continuous zoom video mode output images of the object or scene.</p> <p><i>See, e.g.,</i> element 1.[d] mapped above.</p> <p>To the extent that Apple contends that the Accused Products do not literally infringe this limitation, because there are some circumstances where the product exhibits different or additional behavior to the behavior recited in the limitation, these products still infringe under at least the doctrine of equivalents, as they perform substantially the claimed behavior under typical and intended usage scenarios.</p>
12.[g]	each output image having a respective output resolution,	<p>Apple and/or its customers or end-users of the Accused Product practice a method to provide in the rear multi-aperture camera of the Accused Product provide without fusion continuous zoom video mode output images of the object or scene wherein each output image has a respective output resolution.</p> <p><i>See, e.g.,</i> element 1.[g] mapped above.</p> <p>To the extent that Apple contends that the Accused Products do not literally infringe this limitation, because there are some circumstances where the product exhibits different or</p>

Claim	Claim Element	Accused Product
		additional behavior to the behavior recited in the limitation, these products still infringe under at least the doctrine of equivalents, as they perform substantially the claimed behavior under typical and intended usage scenarios.
12.[h]	wherein the video mode output images are provided with a smooth transition when switching between a lower zoom factor (ZF) value and a higher ZF value or vice versa, and	<p>Apple and/or its customers or end-users of the Accused Product practice a method to provide in the rear multi-aperture camera of the Accused Product provide without fusion continuous zoom video mode output images of the object or scene wherein the video mode output images are provided with a smooth transition when switching between a lower zoom factor (ZF) value and a higher ZF value or vice versa.</p> <p><i>See, e.g.,</i> element 1.[e] mapped above.</p> <p>To the extent that Apple contends that the Accused Products do not literally infringe this limitation, because there are some circumstances where the product exhibits different or additional behavior to the behavior recited in the limitation, these products still infringe under at least the doctrine of equivalents, as they perform substantially the claimed behavior under typical and intended usage scenarios.</p>
12.[i]	wherein at the lower ZF value the output resolution is determined by the Wide sensor while at the higher ZF value the output resolution is determined by the Tele sensor.	<p>Apple and/or its customers or end-users of the Accused Product practice a method to provide in the rear multi-aperture camera of the Accused Product provide without fusion continuous zoom video mode output images of the object or scene wherein the video mode output images are provided with a smooth transition when switching between a lower zoom factor (ZF) value and a higher ZF value or vice versa.</p> <p><i>See, e.g.,</i> the mapping of element 1.[f] shown above.</p> <p>To the extent that Apple contends that the Accused Products do not literally infringe this limitation, because there are some circumstances where the product exhibits different or additional behavior to the behavior recited in the limitation, these products still infringe under at least the doctrine of equivalents, as they perform substantially the claimed behavior under typical and intended usage scenarios.</p>

Claim	Claim Element	Accused Product
13.	The method of claim 12, wherein the step of configuring the camera controller to provide without fusion continuous zoom video mode output images of the object or scene includes configuring each sensor with a setting that depends on the Wide and Tele FOVs and on a sensor oversampling ratio.	<p>Apple and/or its customers or end-users of the Accused Product practice a method to provide a configuration of the camera controller (i.e., <i>see</i> elements 1.[d] and 12.[d] above) that provide without fusion continuous zoom video mode output images of the object or scene includes configuring each sensor with a setting that depends on the Wide and Tele FOVs and on a sensor oversampling ratio.</p> <p><i>See, e.g.,</i> the mappings of element 1.[d] and Claim 4 above.</p>